Supplemental Material:

SI Materials and Methods

Eye Gaze Tracking and Analysis. Eye position was monitored with an infrared camera pointed at the participant's right eye using a head-fixed eye tracking system. The camera was mounted to the chin and forehead rest below the participant's right eye. The X- and Y-coordinates of gaze position and pupil diameter were recorded at a frequency of 90 Hz using ViewPoint EyeTracker® software (Arrington Research, Scottsdale, AZ, USA). Gaze-position was recorded in normalized units relative to the visual field that spanned 50° in the horizontal plane and 15° in the vertical plane in front of the participant and was calibrated for each participant prior to the start of the experiment.

The raw eye-tracking data from the adaptation phases were filtered for eye-blink artifacts by removing all data-points corresponding to pupil diameters that exceeded ±3 standard deviations from the mean. Because the eye-tracking system was fixed and relied on a static head-position, head-movements over time during the nine-minute adaptation blocks could be misinterpreted as shifts in eye-gaze position. Therefore, the X-position and Y-position data points for each adaptation phase within a block were normalized to the mean gaze position during the 5 s countdown phase that preceded that adaptation phase. The countdown phase included a central fixation-cross followed by a flashing white disk in the same location the participants were instructed to imagine seeing the disk appear during the adaption phase. Additionally, it was constant in all conditions in all experiments, which made this period ideal for normalizing all subsequent gaze positions during the adaptation phases to assess any deviation from the central fixation point. **Figures S1-S3** display the kernel density estimation heat maps of the gaze positions during the adaption phases for the three adaptation conditions across all six experiments. The mean X- and Y-gaze positions were then calculated for each condition for each participant and were used to assess whether there were any systematic differences in gaze position across the three adaption conditions in each experiment (**see Figs. S1-S2**). No eye-tracking data was recorded for one participant in Experiment 1, and one participant in Experiment 3 (thus, there are 22 degrees of freedom in the ANOVAs conducted on mean X- and Y-position data from those Experiments). All analyses and statistical tests of the eye-tracking and all other data were performed using the statistical software R ("R : A Language and Environment for Statistical Computing," 2017).

SI Results

Additional Analyses for Experiment 1. An additional analysis was conducted to examine whether the strength of the leftward imagery-induced ventriloquism aftereffect (i.e., Aftereffect Strength for Leftward Adaptation = Leftward Adaptation PSE − Same Adapt. PSE) was significantly different than the strength of the rightward imagery-induced ventriloquism aftereffect [i.e., Aftereffect Strength for Rightward Adaptation Condition = (Rightward Adapt. PSE − Same Adapt. PSE)* −1]. A paired samples t-test revealed that there was no significant difference between leftward and rightward adaptation conditions [$t(23) = -705$, $p = .48$, $d = .14$, 95% CI [−0.26, 0.13]].

Additional Analyses for Experiment 2. Consistent with Experiment 1, we also found a significant shift leftward shift in the participants PSEs following rightward adaption [$t(23) = -4.80$, $p < .001$, $d = .98$, 95% CI [−0.283, −0.113]], and significant shift rightward shift in the participants PSEs following leftward adaptation [$t(23) = 3.25$, $p = .012$, $d = .66$, 95% CI [0.066, 0.298]] compared to the same location adaptation in Experiment 2. A paired samples t-test was also conducted to assess whether the strength of the ventriloquism aftereffect in the leftward adaption condition (i.e., Aftereffect Strength for Leftward Adaptation = Leftward Adaptation PSE − Same Adapt. PSE) was significantly different than the strength of the ventriloquism aftereffect for the rightward adaptation condition [i.e., Aftereffect Strength for Rightward Adaptation Condition = (Rightward Adapt. PSE − Same Adapt. PSE)* −1]. No significant difference between the strength of the leftward and rightward ventriloquism aftereffect was observed [$t(23) = .197$, $p = .85$, $d = .04$, 95% CI [−0.14, 0.18].

Additional Analyses for Experiment 3. No shifts in the participants' PSEs were observed following rightward adaption [$t(23) = .34$, $p = 1.00$, $d = .07$, 95% CI [−0.094, 0.131]] nor leftward adaptation [$t(23) = .57$, $p = 1.00$, $d = .12$, 95% CI [−0.084, 0.148]] compared to the same location adaptation in Experiment 3.

Additional Analyses for Experiment 4. Although a repeated measures ANOVA revealed a significant difference in the participants' PSEs following the different adaptation conditions in this experiment (see Experiment 4 Results in main text), it appears that this effect was driven by a significant shift rightward in the participants' PSE following leftward adaptation (compared to same location adaptation)[$t(23) = 2.79$, $p = .03$, $d = .57$, 95% CI [0.039, 0.266]]. However, there was not a significant ventriloquism aftereffect (i.e., no significant difference between the participants' PSEs following leftward vs. rightward adaptation; see main text for analysis) and an additional analysis revealed that there was no significant shift leftward [$t(23) = 1.37$, $p = .54$, $d = .28$, 95% CI [−0.040, 0.199]] for the participants' PSEs following rightward adaption compared to same location adaptation when the adapted auditory stimuli were 4 kHz tones and the test stimuli were white-noise bursts. As in all previous experiments, all pairwise comparisons were Bonferroni-corrected for multiple comparisons. Furthermore, a comparison of the strength of the ventriloquism aftereffects from real stimuli between Experiment 4 (in which the adapted and test auditory stimuli were different frequencies) and Experiment 2 (in which the adapted and test auditory stimuli were the same) revealed that the aftereffect was significantly reduced in Experiment 4 [$t(46) = -4.12$, $p < .001$, $d = 1.19$, 95% CI [−0.228, −0.078]].

Additional Analyses for Experiment 5. There was a significant shift rightward of the participants' PSEs following leftward adaptation [$t(23) = 3.70$, $p = .003$, $d = .76$, 95% CI [0.098, 0.347]] and a non-significant (i.e., did not survive correction for multiple comparisons) trend leftward following rightward adaption [$t(23) = -1.82$, $p = .24$, $d = .76$, 95% CI [−0.42, 0.027]] compared to the same location adaptation condition. Once again, the strength of the leftward imagery-induced ventriloquism aftereffect (i.e., Aftereffect Strength for Leftward Adaptation = Leftward Adaptation PSE − Same Adapt. PSE) was compared to the rightward imagery-induced ventriloquism aftereffect [i.e., Aftereffect Strength for Rightward Adaptation Condition = (Rightward Adapt. PSE − Same Adapt. PSE)* −1]. No significant difference between leftward and rightward adaptation conditions was observed [$t(23) = -.18$, $p = .86$, $d = .03$, 95% CI [−0.31, 0.26]].

Additional Analyses for Experiment 6. As in Experiment 5, there was a significant shift of the participants' PSEs following leftward adaptation condition compared to the same location adaptation condition [$t(23) = 3.38$, $p = .003$, $d = .69$, 95% CI [0.109, 0.451]], and a non-significant trend leftward following rightward adaptation [$t(23) = -2.29$, $p = .096$, $d = .47$, 95% CI [−0.378, −0.018]] compared to the same location adaptation condition that did not survive correction for multiple comparisons. Once again, a paired samples t-test was conducted to assess whether the strength of the ventriloquism aftereffect in the leftward adaption condition (i.e., Aftereffect Strength for Leftward Adaptation = Leftward Adaptation PSE − Same Adapt. PSE) was significantly different than the strength of the ventriloquism aftereffect for the rightward adaptation condition [i.e., Aftereffect Strength for Rightward Adaptation Condition = (Rightward Adapt. PSE − Same Adapt. PSE)* −1], and no significant difference was observed [$t(23) = -.63$, $p = .54$, $d = .13$, 95% CI [−0.35, 0.19]].

Figures S1-S3

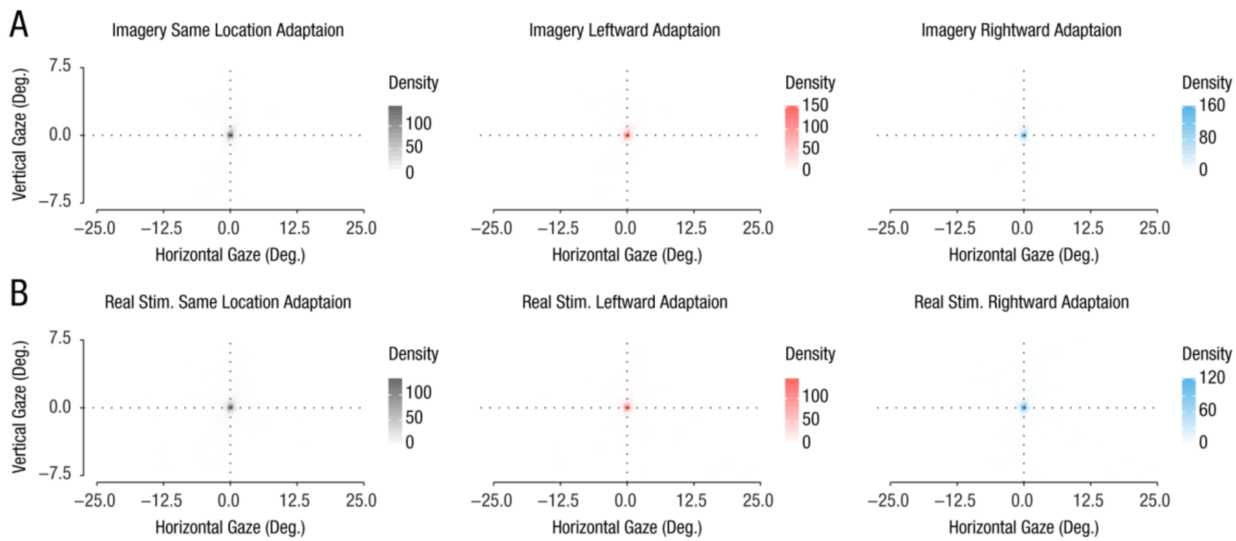

Fig. S1. Eye Tracking Data from Experiments 1 & 2. Heat maps with the kernel density estimation of gaze position for all subjects during adaptation periods from (**A**) Experiment 1 and (**B**) Experiment 2 for the same location, leftward, and rightward adaptation conditions. There was no significant difference in the mean gaze position across adaptation conditions in the horizontal [$F(2, 22) = 0.44$, p =.646, $\eta^2_G = .012$] or vertical [$F(2, 22) = 0.97$, p =.38, $\eta^2_G = .024$] planes in Experiment 1, and no significant difference in the mean gaze position across adaptation conditions in the horizontal [$F(2, 23) = 1.38$, p =.26, $\eta^2_G = .056$] or vertical [$F(2, 23) = 2.58$, p =.09, $\eta^2_G = .039$] planes in Experiment 2.

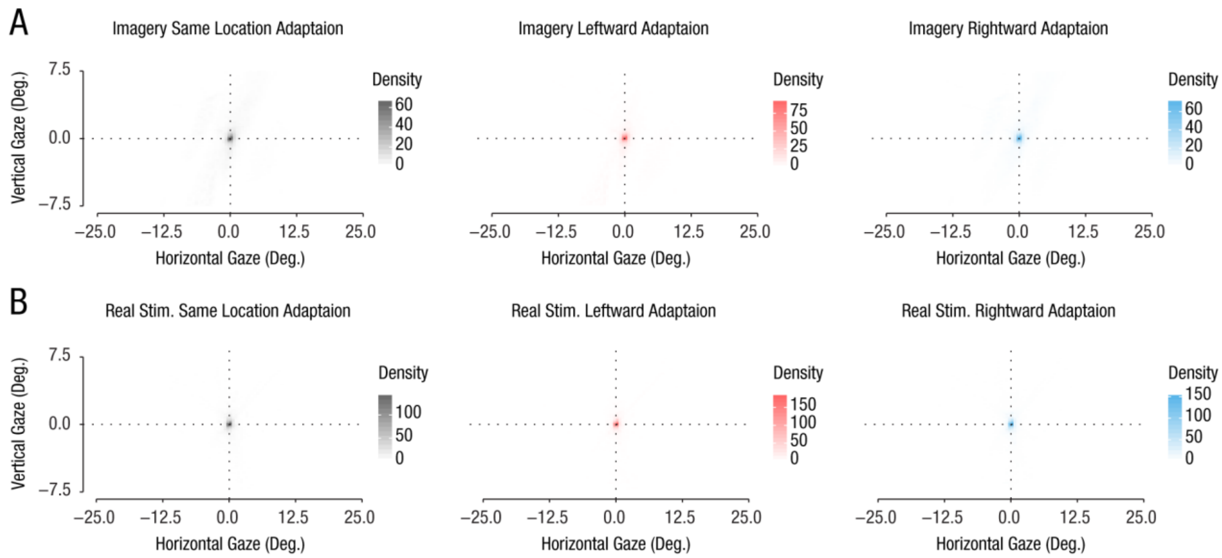

Fig. S2. Eye Tracking Data from Experiments 3 & 4. Heat maps with the kernel density estimation of gaze position for all subjects during adaptation periods from (**A**) Experiment 3 and (**B**) Experiment 4 for the same location, leftward, and rightward adaptation conditions. There was no significant difference in the mean gaze position across adaptation conditions in the horizontal [$F(2, 22)= 1.68$, p = .20, $\eta^2_G = .040$] or vertical [$F(2, 22) = 0.9$, p =.413, $\eta^2_G = .024$] planes in Experiment 3, and no significant difference in the mean gaze position across adaptation conditions in the horizontal [$F(2, 23) = 1.78$, p =.18, $\eta^2_G = .024$] or vertical [$F(2, 23) = 1.84$, p =.17, $\eta^2_G = .024$] planes in Experiment 4.

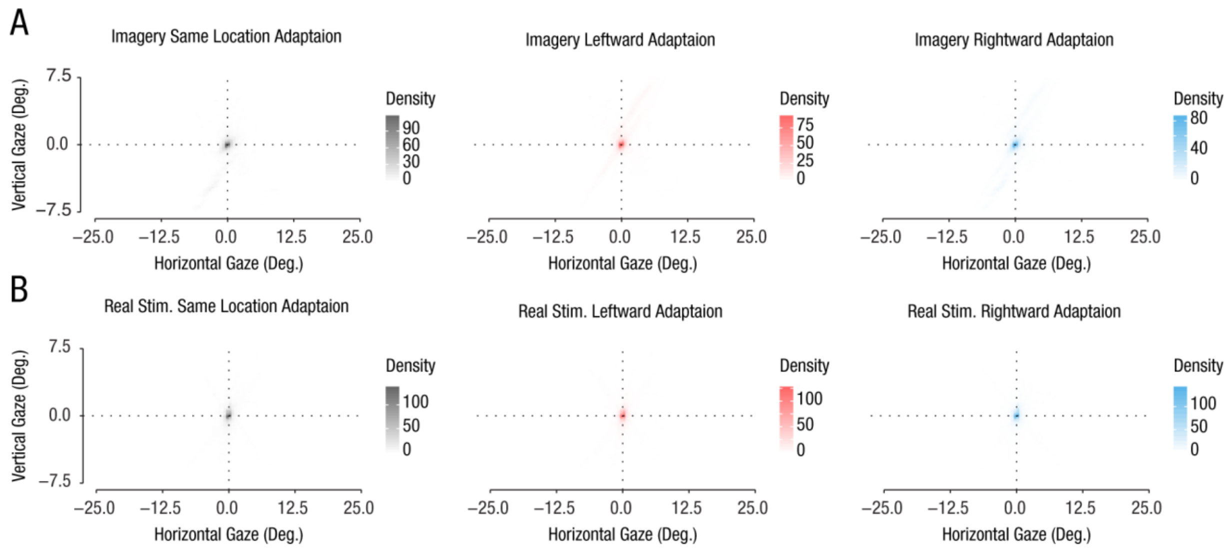

Fig. S3. **Eye Tracking Data from Experiments 5 & 6.** Heat maps with the kernel density estimation of gaze position for all subjects during adaptation periods from (**A**) Experiment 5 and (**B**) Experiment 6 for the same location, leftward, and rightward adaptation conditions. There was no significant difference in the mean gaze position across adaptation conditions in the horizontal [$F(2, 23) = 0.80$, $p = .46$, $\eta^2_G = .019$] or vertical [$F(2, 23) = 2.65$, $p = .08$, $\eta^2_G = .057$] planes in Experiment 5, and no significant difference in the mean gaze position across adaptation conditions in the horizontal [$F(2, 23) = 0.11$, $p = .89$, $\eta^2_G = .003$] or vertical [$F(2, 23) = 64$, $p = .53$, $\eta^2_G = 016$] planes in Experiment 6.